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ABSTRACT

A study was done of the relationship between the American College Testing (ACT) Assessment and the ACT/COMP (College Outcomes Measures Program) test and general intellectual ability of college students. The subjects for the study were 133 undergraduates, mostly freshmen, in Introductory Psychology at the University of Tennessee, Knoxville. The subjects took the Multidimensional Aptitude Battery (MAB), a group-administered intelligence test patterned after the Wechsler Adult Intelligence Scale. Results of the MAB were compared through correlation analysis and five regression analyses with the students' ACT and ACT/COMP scores as retrieved from university records. Variables used included the ACT and ACT/COMP scores, the MAB total score, high school grade point average, and college grade point average (which was measured 2 years later at the end of the sophomore year). Results showed that the students' scores on the ACT and ACT/COMP exams correlate strongly with intelligence as measured by the MAB. The ACT/COMP exam had no relationship with high school grade point average. Intelligence was a strong predictor of ACT Assessment scores, and achievement, while significant, did not explain much of the variance in scores. Overall it appeared that both the ACT Assessment and the ACT/COMP are primarily measures of general intellectual ability rather than achievement. Included are 13 references. (JB)

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JUST WHAT DOES THE ACT ASSESSMENT AND ACT/COMP MEASURE ANYWAY

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This paper was presented at the Thirty-Second Annual Forum of the Association for Institutional Research held at the Atlanta Hilton & Towers, Atlanta, Georgia, May 10-13, 1992. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Jean Endo
Chair and Editor
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JUST WHAT DOES THE ACT ASSESSMENT AND ACT/COMP MEASURE ANYWAY

Abstract

The ACT Assessment and ACT/COMP are two important tests used in colleges and universities, but no published research has examined the relationship between these measures and general intellectual ability. This study found that students' scores on these exams correlate strongly with intelligence as measured by the Multidimensional Aptitude Battery. Regression models that predicted Sophomore Grade Point Average from intelligence or Act Assessment scores and high school GPA explained 98% of the variance. Similarly high levels of variance in ACT/COMP scores were explained by these same variables. It appears that both the ACT Assessment and the ACT/COMP are primarily measures of general intellectual ability.

JUST WHAT DOES THE ACT ASSESSMENT AND ACT/COMP MEASURE ANYWAY

The ACT Assessment is one of the most commonly used college admission tests in the United States, and the ACT/COMP exam is the oldest test for college outcomes assessment. Both these tests claim to be measures of achievement, but the ACT Assessment is sometimes used as a measure of general intellectual ability. The purpose of this paper is to examine the relationship between the ACT Assessment, the ACT/COMP, and general intellectual ability.

According to the ACT Technical Manual, the ACT Assessment is a work sample that measures both students' current level of achievement and their ability to perform college level work (ACT, 1973). As such, the exam is often used to predict college grades (Snowman, Leitner, Snyder, and Lockhart, 1980) and sometimes other student qualities such as reading levels (Ashmore and Cork, 1985). Various studies have used these test scores as measures of general intellectual ability (Pedrini, Tritchler, and Pedrini, 1984; Savage, 1983), but no published study has ever examined the relationship between the ACT Assessment and general intellectual ability.

The ACT/COMP is a test that measures the ability of an individual to function effectively as an adult (Forrest and Steele, 1982). As such, this exam is considered by ACT to be a measure of college achievement and the company recommends its use in college outcomes assessment (Steele, 1989). Some researchers, however, feel that the COMP exam measures little other than

general verbal intelligence (Pike and Banta, 1989) and, therefore, it is not sensitive to college educational influences.

Considering the growth of assessment in colleges and universities and the continuing use of outcomes assessment instruments like the ACT/COMP exam, a study of the relationship between general intelligence and the ACT/COMP exam is in order. Other studies that have examined the relationship of ability and the ACT/COMP exam have used the ACT Assessment as the measure of ability (Pike and Banta, 1989). This makes sense if the ACT Assessment measures general intellectual ability, but if it measures high school achievement as the test company claims (ACT, 1973) then the relationship is one between levels of achievement rather than levels of ability.

No published study to date has examined the relationship between intelligence and either the ACT Assessment or the ACT/COMP exam. This study is designed to fill that void.

METHODS

Subjects

Subjects for this study were 133 undergraduates in Introductory Psychology at the University of Tennessee, Knoxville (UTK). The subjects received two points of extra credit in their class for participating in this study. They were mostly freshmen, 18 or 19 years of age, and 64 percent of them were females.

Instruments

ACT Assessment

The ACT Assessment is an exam designed to assess the potential of individuals for college. It was developed to provide a work sample that would both measure the achievement in high school of the college canidate and give an example of the canidate's likely college performance (ACT, 1973). Three scores are reported from this exam - English, Math, and Total Score. The scores can range from 0 to 35 with most students scoring in the 15 to 30 range.

ACT College Outcomes Measures Program Exam

The ACT College Outcomes Measures Program exam (ACT/COMP) was developed for use in the assessment of general education. Using a unique format of visual and audio displays combined with process type questions, the test developers claim to measure a student's level of effective adult functioning (Forest and Steele, 1982). This exam is the oldest of the general education assessment tests, and it has been used by many institutions for outcomes evaluation.

The test consists of six subscales that are added to form a total score. These six subscales are Functioning within Social Institutions, Using Science, Using Arts, Communication, Solving Problems, and Clarifying Values. Total scores on this exam range from 130 to 240 with an average score for seniors of 185 and a standard deviation of 15.

The University of Tennessee, Knoxville, as a part of a longitudinal study of ACT/COMP scores, administered this exam to freshmen each fall from 1983 to 1989. Scores from these freshmen administrations were available to the investigator and were used in this analysis.

Multidimensional Aptitude Battery

The Multidimensional Aptitude Battery (MAB) is a group administered intelligence test patterned after the Wechsler Adult Intelligence Scale (Jackson, 1984). This exam consists of two subscales of five parts, each of which are summed to provide verbal and performance intelligence scores. These two subscales are added to form a full scale measure of intelligence. The test is a paper and pencil exam and can be administered in groups of any size.

Scores can be obtained either on a traditional I.Q. scale (mean of 100 and standard deviation of 10) or a standard scale such as that used with the Scholastic Aptitude Test (mean of 500 and standard deviation of 100). The standard scale was used in this research because of its interpretability. Scores on this exam, therefore, could range from 200 to 800.

The test is reliable, both internally and over time (Jackson, 1984). The exam's validity was assessed by correlation with the Wechsler Adult Intelligence Scale and strong validity coefficients were obtained (Jackson, 1984). This test, although not quite as accurate a measure of intelligence as the Wechsler,

is, nevertheless, a good substitute measure of adult intelligence.

Variables

The variables used in this analysis consisted of ACT Assessment total score, ACT/COMP total score, MAB total score, high school grade point average (HSGPA), and college grade point average (CUMGPA), which was measured at the end of the sophomore year. MAB total score was an aptitude measure and the two grade point averages were achievement measures.

The use of grade point average to measure achievement has a long history in educational research (Aldag and Rose, 1983; Savage, 1983; Bean and Kuh, 1984; Schuman, Walsh, Olson, and Etheridge, 1985). It was felt in this research that HSGPA could identify the achievement component of the ACT Assessment and the ACT/COMP exam, while MAB total score would identify the intelligence component.

Procedures

Subjects for this study were recruited from their introductory psychology classes. They were offered two points of extra credit in their class and asked to sign up for a specific testing period. The MAB was administered to groups of approximately 20 individuals and the testing took about 1 hour and 15 minutes. The tests were hand scored, and results given to the test-takers.

After completion of the MAB, the student's ACT Assessment scores, freshman ACT/COMP scores, and high school GPA were retrieved from University records. Two years later or at the end of what would normally be their sophomore year, the student's cumulative GPA was also retrieved from the records. A few students had not completed two years of college when the GPA was retrieved and some had completed much more. In both these cases the GPA of record at that time was used.

Data Analysis

The data was analyzed using two different methods. First, a correlational analysis was performed to assess the relationships between the different variables. Then five regression analyses provided prediction models for the ACT Assessment, ACT/COMP, and cumulative GPA. The regression analysis used was Robust Regression advocated by Rousseeuw and Leroy (1987).

One problem with traditional regression analysis is that it is sensitive to outliers (extreme points in the y-direction) and leverage points (extreme data in the x-direction). If an outlier or leverage point is present in the data, it can pull the regression line away from the center of the data and thus distort the descriptive model. Robust regression, rather than minimizing the least sum of squares, minimizes the least median of squares. This measure is less sensitive to outliers and leverage points and, therefore, produces a better descriptive model.

Outliers identified through this method can be eliminated because, for whatever reason, they are extreme points that are

being affected by variables outside the model. The model that is left provides a better description and explanation of the vast majority of the data being analyzed. Thus, a more accurate model of most of the data is developed.

RESULTS

Descriptive Statistics

Table 1 contains the descriptive statistics for the various measures used in this analysis. MAB scores are slightly above

Table 1: Means and Standard Deviations of Test Scores

Test	Mean	Standard Deviation	Sample Size
MAB			
Verbal	555	67.4	133
Performance	560	89.0	133
Full Scale	559	75.1	133
ACT Assess.	21.5	4.4	120
ACT/COMP	173	15.2	110
HSGPA	3.22	0.46	126
CUMGPA	2.86	0.60	133

the national average, while scores on the other measures were similar to those obtained by freshmen at UTK. The sample is representative of students at the University of Tennessee, Knoxville.

It should be noted that there are different sample sizes for each measure. Although 133 students participated in the research and took the MAB, high school GPAs were only available for 126 of

them. Similarly, ACT Assessment scores were available for 120 and ACT/COMP scores were available for 110 of them. The correlations and regression, therefore, use different sample sizes depending on the availability of data.

Correlational Analysis

Table 2 gives the correlations between the various measures. The MAB is strongly correlated with both the ACT Assessment exam and the ACT/COMP exam and less strongly correlated with the two achievement measures. The ACT Assessment is strongly correlated with the ACT/COMP Exam and moderately correlated with both achievement measures. The ACT/COMP, however, is not correlated with high school GPA, but is weakly correlated with Cumulative GPA.

Table 2: Correlations between the Measures

Measure	ACT Assess.	H. S. GPA	CUMGPA	ACT/COMP Total
MAB				
Verbal	.80***	.37***	.36***	.59***
Performance	.55***	.29***	.14	.37***
Full Scale	.75***	.35***	.26**	.52***
ACT Assess.		.46***	.38***	.70***
HSGPA			.50***	.18
CUMGPA				.26**

*** $p < .001$ ** $p < .01$

It appears from this data that the ACT Assessment has a stronger relationship with intelligence than it does with

achievement. The ACT/COMP exam also has a strong relationship with intelligence and no relationship with high school achievement. The finding that the ACT/COMP has a relationship with later achievement in college further suggests its role as an ability measure. To sort out these relationships a series of regression analyses were performed.

Regression Analysis

In the first analysis, ACT Assessment score was regressed on MAB Total Score and high school GPA. The Robust Regression determined that there were three outliers in this data and they were eliminated. In each case, the model under predicted the subject's ACT Assessment score. The final model was significant, $F_{2,111} = 114.52$, $p > .001$, and explained 67% of the variance in ACT Assessment scores. Of this variance, MAB Total Score explained 45.7%, high school GPA explained 5.6%, and the interaction between the two measures explained 16%. Table 3 contains the coefficients for this model.

Table 3: Coefficients for the First Regression

Parameter	Estimate	t-Ratio	Prob.
Intercept	-11.35	4.98	< .001
MAB Total	0.04	12.47	< .001
HSGPA	2.48	4.35	< .001

The second regression analysis regressed ACT/COMP total score on MAB total score and high school GPA. This analysis identified two outliers -- both of which were under predicted by the model. The final model was significant, $F_{2,100} = 26.67$, $p < .001$ and explained 35% of the variance in ACT/COMP scores. MAB total score explained 32.3% of the variance and the interaction between the measures explained 2.5%. High school GPA was not a significant element in this model of ACT/COMP scores. Table 4 contains the coefficients for this model.

Table 4: Coefficients for the Second Regression

Parameter	Estimate	t-Ratio	Prob.
Intercept	108.55	9.77	< .001
MAB Total	0.12	7.04	< .001
HSGPA	-0.51	0.18	.8565

As MAB total score had explained so much of the variance in ACT Assessment score, a third regression analysis was performed regressing ACT/COMP score on ACT Assessment Score and high school GPA. Two outliers were also identified in this analysis -- one over predicted ACT/COMP score and one under predicted it. The model from this analysis was also significant, $F_{2,93} = 48.82$, $p < .001$, and explained 51% of the variance in ACT/COMP scores. As with the previous model, high school GPA was not a significant predictor. ACT Assessment, however, explained 47.4% of the

variance and the interaction between the predictors explained 2.2%. The coefficients for this model are in table 5.

To assess the predictability of college GPA from MAB scores or ACT Assessment scores, two final regressions were performed. The first analysis regressed Cumulative GPA on MAB scores and

Table 5: Coefficients for the Third Regression

Parameter	Estimate	t-Ratio	Prob.
Intercept	133.23	16.25	< .001
ACT Asses	2.55	9.50	< .001
HSGPA	-4.62	1.74	0.0857

high school GPA, while the second substituted ACT Assessment scores for MAB Scores. In the first analysis, three outliers were identified and in each case cumulative GPA was over predicted.

In the final model for this analysis, the intercept term was not significant and the analysis was rerun through the origin. This final model had an $F_{2,121} = 2521.24$, $p < .001$ and explained 98% of the variance in cumulative GPA with the vast majority of the explained variance assigned to the interaction of MAB total score and high school GPA. Table 6 contains the coefficients for this model.

Table 6: Coefficients for the Fourth Regression

Parameter	Estimate	t-Ratio	Prob.
MAB Total	0.001	2.13	0.0354
HSGPA	0.73	8.84	< .001

The analysis regressing cumulative GPA on ACT Assessment and high school GPA identified four outliers that over predicted cumulative GPA. Also, this model, as the previous model, had an insignificant intercept and the regression was rerun through the origin. This final model had an $F_{2,114} = 1776.67$, $p < .001$ and explained 97% of the variance in cumulative GPA with most of the explained variance assigned to the interaction of ACT Assessment and high school GPA. Table 7 contains the coefficients for this model. Both these models were highly significant with ACT Assessment scores and MAB scores similarly interacting with high school GPA to explain almost all the variance in cumulative GPA.

Table 7: Coefficients for the Fifth Regression

Parameter	Estimate	t-Ratio	Prob.
ACT Asses	0.032	2.68	0.0084
HSGPA	0.67	8.29	< .001

DISCUSSION

Correlation analysis and regression analysis were performed to assess the relationship between both the ACT Assessment exam

and the ACT/COMP exam and intelligence. The correlation analysis showed that both exams had a stronger relationship with intelligence than they did with achievement as measured by grade point average. In fact, the ACT/COMP exam had no relationship with high school GPA at all. The regression analyses showed that intelligence was a strong predictor of ACT Assessment scores and achievement, while significant, did not explain much of the variance in scores. Models of the ACT/COMP exam results using both the MAB and the ACT Assessment for predictors explained significant variance in those scores but the models did not include high school GPA. Finally, models for college GPA explained 98% of the variance, but almost all this explained variance was due to the interaction of the ability measure and high school GPA.

This data suggests that both the ACT Assessment and the ACT/COMP exam are measuring ability rather than achievement. The correlations between these two scores and intelligence are high and regression analysis shows that intelligence is a much stronger predictor of these test scores than the achievement measure. In addition when intelligence test scores and ACT Assessment test scores are used in a prediction of college GPA, they explain similar amounts of variance.

This is the first study to examine the relationship between intelligence and ACT Assessment scores and ACT/COMP scores. Therefore, future replications would be in order. While there is no literature to compare this study too, this research is supportive of actual practice in the field. Many studies have

used the ACT Assessment exam as an ability measure (Snowman, Leitner, Snyder, and Lockhart, 1980; Ashmore and Cork, 1985; Pedrini, Tritchler, and Pedrini, 1984; Pike and Banta, 1989), and this study confirms that decision.

Two cautions are in order at this point. First, this research used the ACT Assessment exam and not the Enhanced ACT currently available. While this research probably would generalize to the Enhanced ACT, further research is necessary to confirm that the relationship with intelligence exists there also.

Second, it is hard to remove the effects of achievement from any paper and pencil intelligence test. This research sought to do so by using the total score from the MAB, which included a performance subscale, rather than the subscale scores. However, some variance assigned to ability may actually be the result of high school achievement. It is doubtful, however, that a better measure of intelligence or achievement would substantially change the conclusions of this study.

It appears that the ACT Assessment can be substituted for a more formal test of intelligence with little loss of predictive power. It also appears that the ACT/COMP exam is measuring little other than ability when it is used for assessment purposes. While further research is needed to confirm these findings, they certainly call the use of the ACT/COMP exam for college outcomes assessment into question.

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